Unemployment or protectionism

Some choices for the USA and Western Europe to the year 2000

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This article reports on the economic implications to the USA and Western European economies after imposing protectionist trade policies on selected groups of imports till 2000. The effects of this policy are also presented for Japan and the non-oil-producing developing countries. Before discussing the results of the computations and the import restricting assumptions, a summary of the methodological framework, the World Input–Output Model, used in the computation is presented.

Keywords: Protectionism; Input–output; Global modelling

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The abnormally long and deep recession currently being experienced in the developed economies has resulted in record rates and duration of unemployment in these countries. The still unresolved international banking crisis is partly attributable to the reduction (or total elimination) of economic growth in the developed countries. While this is having severe consequences on living standards in the non-oil-producing developing countries, the high rates of unemployment in the developed economies have begun to strain the social fabric in some countries, which, if not attended to, will ultimately result in political tension, domestically and internationally.

One policy measure aimed at reducing domestic rates of unemployment which is gaining acceptability in some of the developed countries, is the introduction of protectionist trade policies. Restrictions are imposed on the imports of foreign-produced goods in favour of domestic production to generate domestic employment. Whether these measures are introduced through tariff or non-tariff barriers has the same general effect. Other protectionist measures such as restricting exports or subsidizing exports are not considered in this study. Reductions in the level of world trade, if basic Ricardian trade theory is borne out, will lead to reductions in economic efficiency and eventually to lower living standards in developed and developing countries.

This study depicts the current economic situation in the developed countries with particular emphasis on employment and protectionism. First an overview of the structural formulation of the World Input–Output Model, the main methodological tool used in the analysis, is given. In addition, a review of some recent studies completed with the World Model is presented, incorporating factual as well as methodological modifications of the framework introduced since its construction in the mid-1970s.

A description of the World Model

In 1973, the United Nations, with special financial support from the

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Netherlands, commissioned the construction of a general-purpose model of the world economy. To transform the vast collection of microeconomic facts that describe the world economy into an organized system from which macroeconomic projections of future growth could be made, the model was to rely on the method of input–output, or interindustry, analysis. The input–output method depicts the structure of an economy in terms of the flows among its producing and consuming sectors, the real transfer of goods and services. Such transfers can be displayed in a statistical input–output table for the economy. This table in turn provides a basis for constructing at the same time structural equations for each producing and consuming sector whose simultaneous solution provides a numerical picture of a possible future state of the economy. To generate such a projection from the input–output model it is necessary to make a certain number of assumptions about some of the factors that will determine the pace and shape of the economy's future growth. That is, the magnitude of some of the variables in the set of equations must be determined exogenously. By exploring different reasonable assumptions it is possible to project a series of alternative paths for the development of the economy.

The world was subdivided into 15 distinct geographic regions, each one described by an individual input–output table, and these tables were then linked by a network of interregional commodity flows[1].

Even though the overall design of this multiregional model – the first input–output model of the world economy – is simple, constructing it was complex. To begin with, the results of information-gathering efforts throughout the world were combined to create a detailed picture of the input–output structure of each regional economy in 1970 (the model's designated base year). The resulting 15 sets of structural coefficients then had to be entered in a single vast data bank and stored in a computer.

In 1977 a set of detailed projections made using the multiregional input–output model appeared [1]. These projections, all of which begin with the base year 1970, provide comprehensive descriptions of international commodity flows within the 15 regions of the World Model and exports out of and imports into them for the benchmark years 1980, 1990 and 2000. The division of the world into 15 geographic regions with a reasonable degree of economic homogeneity was achieved by ranking all the countries of the world in decreasing order of their average annual per capita income and then combining into 15 (now 16) regions those at about the same stage of economic development and with a comparable endowment of natural resources.

For the purpose of presenting and interpreting the results of global economic projections carried out in regional detail it was convenient to aggregate the 15 regions into three larger groups – the developed regions, the resource-rich less-developed regions, and the resource-poor less-developed regions. In 1970 the developed regions of the world, including (in decreasing order of their average annual per capita income) North America, Oceania (mainly Australia and New Zealand), Western Europe, Japan, the USSR, Eastern Europe (other than the USSR), South Africa and Mediterranean Europe, had a total population of 1.108 billion and an average per capita income of $2 534. The resource-rich less-developed regions, including low-income Latin America and the oil-producing states of the Middle East and tropical Africa, had a total population of 358 million and an average income of $278. The resource-poor less-developed regions, including medium-

[1] The regional breakdown was recently widened to 16 regions – the USA and Canada having been disaggregated from the North American region.

income Latin America, arid Africa, the centrally planned economies of Asia and low-income Asia, had a total population of 2.154 billion and an average income of $186.

Several questions were addressed by the original sets of projections. What are the objective possibilities of closing the income gap between the developed countries and the developing countries? Can such growth be achieved under the current trade and credit policies now in force between the developed and less-developed countries? Could a radical revision of present policies serve to accelerate the growth of the poorer, less-developed nations? And to what extent could a systematic redirection of military spending accelerate the reduction in the income gap? The projections based on the multiregional input–output model, whose projections are grounded in the real data of the world economy, provide a reliable means of arriving at conditional answers to these questions (and many others). To understand how the projections are made it is necessary to consider the structure and workings of the model in more detail.

The database of the multiregional input–output model of the world economy consists of 15 technical-coefficient tables. Each region is visualized as comprising 43 sectors that include four different agricultural sectors (including 'livestock products', 'grain', 'high-protein crops' and 'roots') and 22 manufacturing sectors (including 'food processing', 'textiles', 'fertilizer' and various types ot machinery and equipment). There are individual sectors devoted to 'utilities', 'construction', 'transportation', 'communications' and other services such as medical care, education, repairs and trade. The inputs of nine minerals, including six metals and three types of fuel, are also included, in addition to labour.

Included in the description of the economic activities of each of the 15 regions in the World Model is the emission of eight major types of pollutants and five types of pollution-abatement activities.

Economic growth involves a rise in productive capacities in the form of appropriately proportioned additions to the various components of fixed and working capital. An input–output model, such as the multiregional World Model, that reflects the structural relations between stocks and flows is used for projecting economic growth since it traces forward the investment of an appropriate part of current output into the creation of new productive capacities.

The introduction of new technology into industrial processes registers as changes in both capital coefficients and current input coefficients. These technological changes are reflected in the equations from which the projections are computed.

In the system of input–output equations formulated from the capital and input coefficients for the World Model there are only two types of variables: those representing sectoral outputs and those representing the final demands for goods and services. Obviously there are many other factors that determine the state of the world economy at any given time, and such factors do enter the World Model, through a subsidiary set of equations that serves to compute the final demand for each commodity in the economy. Overall, more than 200 variables enter into these equations, ranging from the traditional macroeconomic aggregates and demographic quantities to geological variables that describe the condition of the land and the reserves of natural resources in the 15 regions of the World Model. In this way a detailed representation of the world economic system is ensured.

The dimensions of the larger matrix are somewhat more than 15 times 175 by 275 so that space is provided for two additional blocks of trade coefficients, which govern the flow of goods and services among the various regions in the model. The foreign trade equations into which they enter describe the structure and balance between exports and imports of some 40 classes of goods and services as well as the capital flows, aid transfers and foreign interest payments. The precise character of the coefficients in the linkage mechanism is based on the introduction of imaginary world 'trade pools' into the analysis of interregional exchanges.

In a world input–output model, although the production and consumption of those goods and services that are not involved in interregional trading must be balanced within each region, just as they are in a national input–output model, the production and consumption of commodities that are transferred from region to region must be balanced only for the world as a whole. Thus a set of equations expressing the existence of such a worldwide input–output balance for each of the interregionally traded commodities must be tied into the internal commodity-balance equations of the 15 regions of the World Model. The coefficients for these trade equations are derived by treating the quantity of each particular type of commodity exported from a given region as a predetermined share of the aggregate world exports of that commodity and the quantity imported into the region as a fixed proportion of the total amount consumed in that region, as if all exports of each interregionally traded commodity were delivered to a single worldwide trading pool from which imports were then drawn.

The introduction of imaginary worldwide pools into the World Model for each of the internationally traded goods permits the description and analysis of the international division of labour without attempting to describe or explain the often unstable bilateral trade patterns between two regions. This enables the World Model to be compatible with the current theory of international trade without relying unduly on its immediate applicability.

Assembling the thousands of numbers needed to implement the model was a demanding task. The bulk of the information about the technical structure of modern manufacturing, mining, transport, service industries and agriculture – the set of input coefficients for a world structural matrix – was drawn from existing tables for the developed countries, in particular the 1967 USA table and the version of that table updated to 1970. The usefulness of tables for most of the less-developed countries was greatly diminished by incompatabilities in classification and economic activities and in conventions used to measure the inputs and outputs of various types of goods and services. National-income accounts, foreign-trade statistics and demographic statistics compiled by the UN and its affiliated organizations were treasure troves of systematically organized data, without which it would have been impossible to complete a base-year description of the world economy.

In the long run the most important aspect of structural change and development is the incorporation of new technologies into industrial and agricultural processes. For the developed countries this growth takes the form of the introduction of entirely new technologies and new commodities; for the less developed countries it generally involves the adoption or adaptation of technologies already incorporated in the technological recipes of the more advanced countries. These transformations are reflected in the input–output matrix of an economy by

the continual replacement of old input and capital coefficients by new ones. As such technological transfer is closely associated with the economic advance of less developed regions (as measured by increases in their per capita income), in preparing a structural database for implementing the World Model it was also necessary to assemble a series of what might be called structural templates – each comprises arrays of capital and input coefficients characterizing the state of technology at one of the successive stages of technological advance.

In the course of computing a projection, as the computer programs for implementing the World Model advanced in their calculations from the base year 1970 to 1980, 1990 and finally 2000, the templates in these series were inserted one after another into the world input–output matrix. A similar procedure was applied to estimate the prospective changes (for the most part decreases) in the magnitude of labour input coefficients resulting from the introduction of improved technology, and also the prospective changes (for the most part increases) in the input and capital coefficients describing mining and other extractive industries reflecting future shifts to less accessible reserves of primary resources. Gradual changes in export shares and import coefficients were also registered in the model and played an important part in projecting the future flows of interregional trade.

Recent studies using the World Model

Since its construction in the mid-1970s, the World Model has been used to address a number of questions in several specialized studies ranging from projecting the future of world ports to the global implications of alternative levels of military expenditure (and some alternative ways of disbursing the savings resulting from the limitations on military spending) [2,3]. The question of alternative population projections and their global implications for increasing living standards in the less developed countries was also considered within the framework of the model [4]. The model was recently employed to take a first view of worldwide food and energy requirements based on the latest UN population projections until 2030 [8]. To sharpen the projections, the energy conservation and substitution measures already in place and those likely to be implemented over the time frame considered were also incorporated. Another recently completed study is on the subject of projecting the future production and consumption of non-fuel minerals requirements till 2030 [5]. The minerals covered in that study included all the major ferrous and non-ferrous metals as well as the major chemical and fertilizer minerals.

The most recent study which incorporates a major revision and application of the World Input–Output Model is *The Soviet Economy Within A Global Framework: Input–Output Projections to the Year 2000* [6,7]. Among the major revisions carried out for this study was the replacement of the 'old' regional matrix with a 'new' one which more accurately describes the sets of relations which govern the activities between the producing and consuming sectors of the Soviet economy and the activities which link the Soviet economy to the world economy and *vice versa*, eg the Western financed Soviet natural gas pipeline now under construction.

Concurrent with the study on the USSR was the updating of four agricultural sectors represented in the World Model to incorporate 1980

regional control totals for production, consumption, imports and exports.

Recently the export shares for 1980 were updated to reflect the actual 1980 trade flows in the CHELEM database made available to the Institute for Economic Analysis by the Centre d'Etudes Prospectives et d'Informations Internationales [9].

The assumptions

Before describing the alternative scenarios which outline the unemployment–protectionist choices, it would be useful to set down, in an explicit way, the assumptions used to describe the introduction of protectionist policies within the framework of the World Model.

Historically speaking, the main long-term constraint on accelerated growth in the developed regions has been the rate of productivity growth of labour and the growth in the labour force. Consequently, though increases in labour productivity are embedded within the projected structural matrices of each of the regions represented in the World Model, full employment of the available labour force is the assumption that was used in all the computations for developed countries up to now.

As far as the less-developed regions of the world are concerned, their main constraint to higher growth has been a shortage of foreign exchange – required to buy modern technology from the developed countries. That is, the balance-of-payments constraint is used as the control instrument for accelerating or retarding growth in some of the developing regions of the world. Consequently, for the purposes of realism, the balance of payments, for most of the resource-poor developing countries, is retained and set exogenously at zero.

In order to address the major economic issues now facing the developed regions, it was necessary to abandon the assumption of full employment of the labour force. As mentioned above, the thinking in some circles has been to erect tariff and non-tariff barriers and replace imports with domestically produced goods, in that way reducing domestic unemployment. For this purpose, selected sectors in the World Model were chosen and the import dependence – ie the import coefficients – of two regions, the USA and Western Europe, for selected sectors was reduced in 1990 and 2000. The sectors chosen in the US and Western Europe regional blocks include textiles, chemicals and chemical products, steel, motor vehicles, shipbuilding, machinery, appliances, professional instruments, and watches and clocks. The assumed import coefficients in the two regions both before and after the introduction of the protectionist policies, for 1990 and 2000, are shown in Table 1.

A description of the alternative scenarios

For the purposes of describing the introduction, and assessing the implications, of growing protectionist measures in the USA and Western Europe high income (WEH), to the year 2000, four alternative scenarios – each incorporating a different set of assumptions about employment, import coefficients and GDP growth – were designed. The progression from Scenario 1 to Scenario 4 follows the evolution of assumptions from the early or mid-1970s for the USA and WEH towards a policy of deliberately introducing protectionist trade

Table 1. Base, 'historical' and protectionist import coefficients in selected sectors for USA and WEH.[a]

	Import coefficients					
	1980 (base)		2000 'Historical'		1990 and 2000 'Protectionist'	
Sector	**USA**	**WEH**	**USA**	**WEH**	**USA**	**WEH**
Textiles, apparel	0.070	0.420	0.069	1.090	0.053	0.315
Industrial chemicals	0.050	0.419	0.056	0.499	0.056	0.314
Misc chemical products	0.021	0.227	0.023	0.270	0.056	0.170
Motor vehicles	0.210	0.377	0.210	0.475	0.157	0.283
Shipbuilding	0.086	0.297	0.115	0.375	0.064	0.222
Metal products	0.033	0.088	0.041	0.067	0.025	0.067
Machinery	0.062	0.391	0.069	0.466	0.046	0.293
Electric machinery	0.113	0.360	0.142	0.483	0.085	0.270
Professional instrument	0.117	0.551	0.152	0.665	0.088	0.413
Watches, clocks	0.149	0.407	0.152	0.491	0.112	0.305
Iron output[b] (million tonnes)	59.7	99.4	93.7	140.2	1990:85.0 2000:107.0	140.2

[a] Base denotes 1980; 'historical' denotes 2000 values projected for the original World Model study (1975); import coefficients denote ratio of import levels to domestic output levels.
[b] Due to the way minerals are incorporated in the World Model, for regions which are net importers, domestic outputs are projected and then set exogenously, import levels are determined endogenously.

measures. Table 2 presents an overview of the four scenarios with respect to changes in the key variables – GDP, employment, imports, consumption and balance of payments – for this study.

- Scenario 1 serves as a benchmark set of assumptions, ie full-employment growth with a gradual tendency to open the USA and WEH to *more* import dependence until 2000.[2] In a sense this can be called an 'early and mid-1970s set of assumptions'.
- Scenario 2 introduces a set of assumptions which can be called an 'early 1980s' scenario for WEH and the USA – high unemployment (10% of the labour force) along with unchanged import coefficients in the relevant trading sectors.

[2] This is manifested by increased import coefficients from 1980 to 2000 in WEH in *all* the relevant trading sectors, and for *most* of the USA import coefficients for these traded goods as presented in Table 1.

Table 2. Alternative scenarios.

Variables	Scenarios 1	2	3	4
GDP	Developed regions: endogenous Developing regions: Asia centrally planned and oil set exogenously; all other developing regions: endogenous		USA and WEH set at scenario 2 GDP levels All other developed: endogenous Developing regions: as in 1 and 2	As in scenarios 1 and 2
Employment	Developed: employment equal to exogenously set labour force Developing: endogenous	USA and WEH: Unemployment set at 10% of estimated labour force Other developed: employment equal to exogenously set Labour Force Developing: endogenous	USA and WEH: endogenous Other developed: equal to exogenously set labour force Developing: endogenous	As in scenario 1
Investment	Endogenous			
Consumption	Endogenous			
Govt Civilian	All regions: exogenously set as a share of GDP			
Military	USA and USSR: exogenously set levels at parity All others: exogenously set as a share of GDP			
Imports	Import coefficients set at 'historical' values for all regions		USA and WEH: selected import coefficients reduced to reflect protectionist trade policies *All other regions: import coefficients set at 'historical' values*	
Balance of payments	Developed regions: endogenous Developing regions: Asia centrally planned and oil, endogenous. Other developing: exogenous			

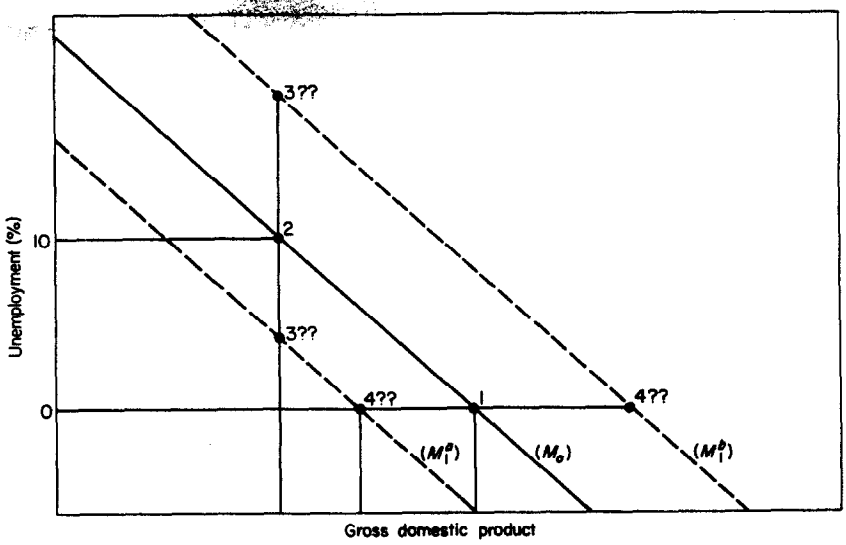

Figure 1. Schematic overview of the scenarios.

- Scenario 3 coincides with a world that is likely to emerge in the mid-1980s, as WEH and the USA respond to the politically unsustainable set of assumptions contained in scenario 2. Scenario 3 takes as given the low GDP growth in WEH and the USA which emerges from the high level of unemployment in the previous scenario, but counters the latter problem by reducing, by 25% below the 1980 base, selected import coefficients of the two regions, in order to produce at 'home' what was once produced 'abroad'. The changes introduced in the import coefficients appear in Table 1. Due to balance of payments restrictions placed on other regions, it is not certain, *a priori*, that more rather than less employment will be generated in WEH and the USA. This is so, because the level of world trade (and exports) will decrease, whereas WEH and the USA are major exporting regions.
- Scenario 4 restores full employment again, but this time with the protectionist trade policies of the previous scenario incorporated into its set of assumptions.

The logic of the scenarios is shown schematically in Figure 1. M_o indicates the initial set of import coefficients, while M_1 incorporates the import coefficients resulting from the introduction of protectionist trade policies. M_1^a would be the appropriate trade-off curve if the structure and level of world trade is currently conducted under the dictates of Ricardian comparative advantage. M_1^b would be the appropriate trade-off curve if the structure and level of world trade is *not* currently being conducted along Ricardian lines. It is, of course, impossible to know beforehand the GDP and consumption levels that result from changes in import dependency, ie import protection in WEH and the USA.

Results and conclusions

The results of the computations of the four scenarios are summarized in Tables 3–6. As expected, for the two 'protected' regions, the USA and WEH, their respective external positions (balance of trade and balance of payments) improve at the expense of living standards, ie per capita

Table 3. Summary of results of the alternative scenarios: USA.

		1990				2000			
Macroeconomic variables	**1980(B)**	**B**	**2**	**3**	**4**	**B**	**2**	**3**	**4**
GDP (billions of 1970 dollars)	1350.0	1751.0	1489.0	1489.0	1753.6	2241.0	1848.0	1848.0	2249.8
Employment (million man-years)	107.0	123.8	111.5	111.5	123.8	143.0	129.7	129.7	143.0
Consumption per capita (1970 dollars)	3665.0	4171.0	3744.0	3733.0	4159.0	4837.0	4065.0	4061.0	4840.0
Balance of trade (billions of 1970 dollars)	−4.7	33.6	44.5	48.8	35.0	67.5	83.6	86.2	71.5
Balance of payments (billions of 'Current' dollars[a])	−27.27	6.98	24.28	26.72	9.89	9.99	28.0	28.0	10.1

[a] 'Current' dollars can be interpreted to mean exports and imports evaluated at new relative prices which were recomputed each decade. See Chapter XIV of *The Future of the World Economy* [1].

Table 4. Summary of results of the alternative scenarios: Western Europe (high-income).

		1990				2000			
Macroeconomic variables	**1980(B)**	**B**	**2**	**3**	**4**	**B**	**2**	**3**	**4**
GDP (billions of 1970 dollars)	988.24	1530.5	1380.5	1380.5	1529.3	1922.0	1729.9	1729.9	1923.4
Employment (million man-years)	125	130	117	117.5	130	135.7	122	122	135.7
Consumption per capita (1970 dollars)	2272	3259	3041	3005	3215	4106	3698	3595	3996
Balance of trade (billions of 1970 dollars)	46.8	71.3	77.7	95.8	91.0	143.5	149.6	190.7	198.1
Balance of payments (billions of 'Current' dollars[a])	2.55	−32.3	−19.5	−8.92	−20.7	−21.3	−14.1	0.26	−6.43

[a] 'Current' dollars can be interpreted to mean exports and imports evaluated at new relative prices which were recomputed each decade.

Table 5. Summary of results of the alternative scenarios: Japan.

		1990				2000			
Macroeconomic variables	**1980(B)**	**B**	**2**	**3**	**4**	**B**	**2**	**3**	**4**
GDP (billions of 1970 dollars)	387	679	679	679	679	949	948	945	946
Employment (million man-years)	59.19	63.17	63.17	63.17	63.17	67.64	67.64	67.64	67.64
Consumption per capita (1970 dollars)	2127	3432	3465	3516	3490	4684	4725	4817	4786
Balance of trade (billions of 1970 dollars)	10.5	21.0	15.0	5.2	9.9	36.0	28.6	10.8	16.3
Balance of payments (billions of 'Current' dollars[a])	−6.7	−13.2	−17.5	−23.32	−19.8	−21.8	−21.8	−26.3	−26.56

[a] 'Current' dollars can be interpreted to mean exports and imports evaluated at new relative prices which were recomputed each decade.

Table 6. Summary of results of the alternative scenarios: developing countries (resource poor).[a]

		1990				2000			
Macroeconomic variables	**1980(B)**	**B**	**2**	**3**	**4**	**B**	**2**	**3**	**4**
GDP (billions of 1970 dollars)	595.6	966.1	926.5	901.1	938.1	1514.3	1446.3	1387.7	1450.4
Employment (million man-years)	254.0	428.3	412.1	401.5	416.5	548.5	527.7	506.0	524.8
Consumption per capita (1970 dollars)	142.3	209.2	241.9	198.4	205.2	275.7	263.4	255.6	267.2
Balance of trade (billions of 1970 dollars)	−6.8	−5.8	−6.2	−10.0	−10.1	−0.1	−1.5	−11.4	−11.4
Balance of payments (billions of 'Current' dollars[b])	−3.9	0.3	−0.3	−0.7	−0.5	−1.3	−1.7	−2.5	−2.4

[a] These countries include the following regions: Arid Africa, Asia centrally planned, Asia low-income, Latin-America medium-income.
[b] 'Current' dollars can be interpreted to mean exports and imports evaluated at new relative prices which are recomputed each decade.

consumption. (In the case of the USA the trade-off was negligible.) These results do provide some evidence that the structure and pattern of international trade as described in the World Model are conducted along Ricardian principles of comparative advantage.

Turning to Japan in Table 5, since the full-employment assumption is still the constraint on Japanese economic activity, per capita consumption should have increased under protectionist scenarios 3 and 4 as consumption absorbed that part of final output lost to export markets in the rest of the world. This was, in fact, the result, but the price Japan must pay is a worsening external imbalance, which in the short run

would have to be rectified by contractionary policies at home, cutting per capita consumption levels.

As for the developing, resource-poor countries, the implementation of protectionist policies in the USA and WEH has little or no effect on living standards in these regions. This is because most of the 'protected' sectors were not sectors in which these developing (non-resource) countries' exports are concentrated. Nevertheless, living standards did fall in scenarios 2 and 3, in those scenarios in which the level of economic activity in the USA and WEH fell because of unemployment. Once income growth was restored in these two regions to the full-employment level (with import restrictions) living standards returned to their near 'normal' base level.

While it might appear that a reduction of $110 (in 1970 dollars) in per capita consumption in WEH is not an excessive price to pay for full employment, the indirect effects of protectionism which were not assessed in this study might overwhelm the direct effects. One such indirect effect, for example, is the reduction in competition, leading to higher unit prices and losses in efficiency eventually lowering living standards below their projected potential. However, this subject goes beyond the scope of this study.

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